CLAIMS

WE CLAIM:

1. A method of monitoring strain in a structure, comprising:

selecting a minimum resolvable distance along a length of a structure;

calculating a quantity of plurality of laterally adjacent conductors for enabling resolution of the minimum resolvable distance;

forming the plurality of conductors in secure relationship to the structure, each conductor comprised of a plurality of segments coupled in series, each of the segments corresponding to the minimum resolvable distance along the length of the structure, each segment having an associated unit value representative of a defined energy transmitting characteristic; and

comparing a first change in the defined energy transmitting characteristic in at least one conductor of the plurality with a second change in the defined energy transmitting characteristic in at least one other conductor of the plurality.

2. The method of claim 1, wherein calculating comprises calculating a quantity of plurality of laterally adjacent conductors for enabling resolution of the minimum resolvable distance, the quantity corresponding to a number of digits having a number of resolvable prime numbers at least equal to the quantity of the plurality of segments in each conductor.

3. The method of claim 2, wherein the quantity of defined energy transmitting characteristics is equal to the base of the digits designating the resolvable prime numbers.

4. The method of claim 1, further comprising defining a plurality of identity groups, each identity group including a plurality of laterally adjacent segments wherein each identity group includes at least one segment from each of the plurality of conductors.

5. The method of claim 1, further comprising:

transmitting energy through each of the plurality of conductors; and

monitoring each of the plurality of conductors for changes in the defined energy transmitting characteristic.

6. The method of claim 1, wherein the energy is light and the change includes one of attenuation and phase change.

7. The method of claim 1, wherein the energy is electrical and the change includes resistivity change.

8. The method of claim 1, further comprising locating the strain to a strained segment along the length of the structure.

9. The method of claim 8, wherein locating the strain comprises identifying one of the plurality of segments as the strained segment when a first strained ratio between an unstrained defined energy transmitting characteristic and the first change in the defined energy transmitting characteristic in the first conductor correlates with a second strained ratio between an unstrained defined energy transmitting characteristic and the second change in the defined energy transmitting characteristic in the second conductor.

10. The method of claim 9, further comprising quantifying the strain in the length of the structure.

11. The method of claim 10, wherein quantifying comprises determining a ratio of the difference between the sum of said first and second changes and said unstrained defined energy transmitting characteristics for each of the strained segments in the plurality of conductors and the unstrained defined energy transmitting characteristics.

12. The method of claim 1, wherein forming the plurality of conductors further comprises locating each of the plurality of conductors to sustain approximately equal amounts of strain.

13. The method of claim 1, wherein the minimum resolvable distance is greater than a distance spanned by the strain in the structure.

14. A strain monitor, comprising:

a plurality of laterally adjacent conductors configured for attaching along a length of a structure, each of the plurality of laterally adjacent conductors including a plurality of segments coupled in series and each of the plurality of segments and defining a minimum resolvable distance, the plurality of laterally adjacent conductors including at least a quantity of laterally adjacent conductors corresponding to a number of digits having a number of resolvable prime numbers at least equal to the quantity of the plurality of segments in each of the plurality of laterally adjacent conductors; and

a plurality of identity groups, each identity group including a plurality of laterally adjacent segments including at least one segment from each conductor, wherein each segment within an identity group exhibits an associated unit value representative of a defined energy transmission characteristic such that the unit values of each identity group may be represented by a concatenated digit string of the unit values contained therein and wherein the concatenated digit string of each identity group of the plurality is a unique one of the resolvable prime numbers.

15. The strain monitor of claim 14, wherein a quantity of defined energy transmitting characteristics is equal to the base of the digits designating the resolvable prime numbers.

16. The strain monitor of claim 14, wherein the plurality of conductors are proximally located to sustain approximately equal amounts of strain.

17. The strain monitor of claim 14, wherein the plurality of conductors is configured to be attached to the surface of a structure.

18. The strain monitor of claim 14, wherein each segment is configured to exhibit a change in the defined energy transmission characteristic upon experiencing a strain therein.

19. The strain monitor of claim 14, wherein a plurality of ratios are defined between the associated values of each segment of a given identity group and each other segment of the given identity group and wherein each of the plurality of ratios within the given identity group is unique.

20. The strain monitor of claim 14, wherein the plurality of conductors comprises a plurality of conductive traces.

21. The strain monitor of claim 14, wherein the associated unit value of each of the plurality of segments corresponds to a cross-sectional area exhibited thereby.

22. The strain monitor of claim 14, further comprising a transmitter and receiver operably coupled to and configured to monitor energy through the plurality of laterally adjacent conductors.

23. A structure, comprising:

at least one structural member;

a plurality of conductors attached to the at least one structural member, each conductor of the plurality including a plurality of segments coupled in series with each of the plurality of segments defining a minimum resolvable distance, the plurality of laterally adjacent conductors including at least a quantity of laterally adjacent conductors corresponding to a number of digits having a number of resolvable prime numbers at least equal to the quantity of the plurality of segments in each of the plurality of laterally adjacent conductors; and

a plurality of identity groups, each identity group including a plurality of laterally adjacent segments including at least one segment from each conductor, wherein each segment within an identity group exhibits an associated unit value representative of a defined

energy transmission characteristic such that the unit values of each identity group may be represented by a concatenated digit string of the unit values contained therein and wherein the concatenated digit string of each identity group of the plurality is a unique one of the resolvable prime numbers.

24. The structure of claim 23, wherein the plurality of conductors are proximally located to sustain approximately equal amounts of strain.

25. The structure of claim 23, wherein a quantity of defined energy transmitting characteristics is equal to the base of the digits designating the resolvable prime numbers.

26. The structure of claim 23, wherein each segment is configured to exhibit a change in the defined energy transmission characteristic upon experiencing a strain therein.

27. The structure of claim 23, wherein a plurality of ratios are defined between the associated values of each segment of a given identity group and each other segment of the given identity group and wherein each of the plurality of ratios within the given identity group is unique.

28. The structure of claim 23, wherein the at least one structural member comprises at least one conduit for conveying a fluid medium and wherein the plurality of conductors are attached to an interior surface of the at least one conduit.

29. The structure of claim 23, wherein the plurality of conductors includes conductive traces and wherein each conductive trace is mutually isolated from transmission of energy with respect to each other conductive trace.

30. The structure of claim 23, wherein each of the plurality of conductors comprises a length of approximately twenty miles.

31. The structure of claim 23, wherein the each of the plurality of segments comprises a length of approximately twenty feet.